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California Energy Commission
DOCKETED
12-EBP-1
TN # 67998
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VIA ELECTRONIC MAIL: docket@energy.ca.gov

October 23, 2012

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 12-EBP-1
1516 Ninth Street
Sacramento, CA 95814-5512

Re: **California Energy Commission Docket No. 12-EBP-1 - Comprehensive Energy Efficiency Program for Existing Buildings (AB 758) Scoping Report Staff Workshop**

Dear Commissioners and Staff:

Thank you for all the hard work and planning that went into the October 8 – 9, 2012 Workshop on AB 758. The Workshop provided a great deal of information on the truly huge challenge – and opportunity – to increase the energy efficiency performance of both residential and non-residential buildings in California so they can meet Title 24 energy efficiency standards.

The purpose of this letter is to provide the California Energy Commission and staff (CEC) brief comments from Johns Manville (JM) on this issue. JM, a Berkshire Hathaway company (NYSE: BRK.A, BRK.B), is a leading manufacturer and marketer of premium-quality products for building insulation, mechanical insulation, commercial roofing, and roof insulation, as well as fibers and nonwovens for commercial, industrial, and residential applications.

With world headquarters in Denver, CO, JM's 7,000 employees at our forty-five manufacturing facilities serve North American, European, and Asian markets that include residential and commercial construction, wind energy, aerospace, automotive and transportation, air handling, appliance, HVAC, pipe and equipment, filtration, waterproofing, flooring, and interiors. Notably, JM is the only manufacturer to offer a complete line of certified Formaldehyde-free™ fiber glass building insulation. JM makes home insulation products that are certified to meet the ***Environmentally Preferable Insulation*** specification developed by

U.S. EPA Region 9 and Alameda County, State of California. JM is a member of ***The Climate Registry*** and is also the only insulation manufacturer to have achieved the status of California **Climate Action Leader**.

One of our flagship North American manufacturing locations making Formaldehyde-free™ fiber glass home insulation is in Willows, CA (Glenn County), about an hour north of Sacramento.

Expanding the Number of Energy Efficiency Retrofits of Existing Homes and Buildings is Vital to Achieving California's Environmental, Energy and Public Health Goals

AB 32 established the goal that California achieve a reduction of greenhouse gas (GHG) emissions to 1990 levels by 2020. The law also required that the California Air Resources Board (CARB) develop a scoping plan to outline the State's overall strategy to achieve that 2020 GHGs emissions reduction goal. After much study and public input, CARB in December 2008 issued its Climate Change Scoping Plan,[1] which identifies a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health.

Section II.C. of the Scoping Plan identifies specific emissions reduction measures needed to achieve the State's GHG emissions goal. Several of the recommended actions focus on the critical importance of energy efficiency:

> *Maximize energy efficiency building and appliance standards, and pursue additional efficiency efforts including new technologies, and new policy and implementation mechanisms. Pursue comparable investment in energy efficiency from all retail providers of electricity in California (including both investor-owned and publicly owned utilities).*

Scoping Plan at page 41.

The importance of energy efficiency is driven home by the Scoping Plan's Table 2: "Recommended Greenhouse Gas Reduction Measures" on page 17, which recognizes that energy efficiency is even **more important** than the 33% renewable portfolio standard (RPS) in achieving the AB 32 GHG emissions reduction goals. CARB estimates that energy efficiency will result in emissions reductions of 26.3 $MMTCO2_E$ in 2020, while the 33% RPS is estimated to achieve only 21.3 $MMTCO2_E$ in 2020.

[1] Climate Change Scoping Plan: *a famework for change*, California Air Resources Board (December 2008, updated May 2009); http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf

Among the Scoping Plan quotes on energy efficiency are the following:

- Page ES-13: "Many older homes can be retrofitted to use far less energy than at present."
- Section II. Recommended Actions at page 58 states: "Furthermore, retrofitting existing residential and commercial buildings would achieve substantial greenhouse gas emissions reduction benefits."
- Recommended Actions – Efficiency at page 42: "**Strategies for Existing Buildings -** Voluntary and mandatory whole-building retrofits for existing buildings."
- Green Building Strategy at page 57: "As the Governor recognized in his Green Building Initiative (Executive Order S-20-04), significant reductions in greenhouse gas emissions can be achieved through the design and construction of new green buildings as well as the sustainable operation, retrofitting, and renovation of existing buildings."
- Recommended Actions at page 58: "This Scoping Plan . . . further recommends that California adopt mechanisms to encourage and require retrofits for buildings that do not meet minimum standards of performance."
- Recommended Actions at page 58: "Achieving significant greenhouse gas emissions reductions from new and existing buildings will require a combination of green building measures for new construction and retrofits to existing buildings."

In addition, in 2008 the California Public Utilities Commission (PUC) adopted and in 2011 updated a ***Long Term Energy Efficiency Strategic Plan***[2] (Strategic Plan). The Strategic Plan calls for a 40% reduction in energy use across the approximately 13 million single-family and multi-family homes in the State by 2020. The high level goal of the Strategic Plan is to help establish long-lasting sustainable changes by reducing barriers to the adoption of energy efficiency measures to the point where further publicly funded intervention is no longer appropriate.

Energy efficiency is also an important adaptation measure to mitigate the health impacts of a warming climate. The ***State of California Extreme Heat Adaptation Interim Guidance Document***[3] (Heat Adaptation Guidance) provides

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[2] ***CA Energy Efficiency Strategic Plan – Strategic Plan Progress Report***, California Public Utilities Commission, Energy Division (Octboer 2011) at page 7; http://www.cpuc.ca.gov/NR/rdonlyres/5D0472D1-0D21-46D5-8A00-B223B8C70340/0/StrategicPlanProgressReportOct2011.pdf

[3] ***State of California Extreme Heat Adaptation Interim Guidance Document***, developed by the Heat Adaptation Workgroup of the Public health Workgroup, California Climate Action Team

direction for incorporating extreme heat projections into planning and decision making in California based on current climate change models. The Heat Adaptation Guidance focuses on the human health aspects of increasing temperature in California, including longer and more frequent extreme heat events, which pose substantial additional risk of illness and death to the state's residents, especially to vulnerable populations. It also provides recommendations for consideration by state agencies related to extreme heat preparedness and response and to strategies for cooling the built environment. Retrofitting older homes, especially for vulnerable populations, is a vitally important method to cost-effectively mitigate this looming health risk.

The Number of Existing Residential Retrofits Falls Far Short of What is Needed to Achieve the State's Environmental, Energy, and Public Health Goals

There are approximately 8.4 million single family homes in California.[4] These homes consume approximately $17 billion in energy per year and are responsible for a significant percentage of greenhouse gas and other emissions as well as the health and environmental impacts of those emissions. Although California leads the nation in the energy efficiency performance of new homes, approximately two-thirds of the State's existing homes, or approximately 5.6 million, homes were built before the original Title 24 energy code provisions were adopted in 1978.[5] Since the majority of these older homes will still be standing in 2050, improving their energy performance will be critical to the State in achieving its environmental, energy, and public health goals, including the AB 32 goal of reducing state-wide GHG emissions to 1990 levels by 2020.

The results of the current residential retrofit program – Energy Upgrade California – have been disappointing at best. As reported recently in the **San Francisco Chronicle**,[6] between January 2011 and July 2012 just 5,130 homes received upgrades or qualified for rebates vs. the Energy Commission goal of 100,000.

(August 31, 2012); http://op.bna.com/env.nsf/id/avio-8z6ppq/$File/2012-08-31_Extreme_Heat_Adaptation_Interim_Guidance_Document.pdf

[4] ***Energy Efficiency Financing in California—Needs and Gaps – Preliminary Assessment and Recommendations***, Harcourt Brown & Carey, Inc., (July 8, 2011) at page 11; http://uc-ciee.org/downloads/EEFinanceReportCarey.pdf

[5] ***Pulling the Trigger: Increasing Home Energy Savings***, CalCEF (July 2012) at page 6; http://calcef.org/files/20120723_bamberger.pdf (citing U.S. Census Bureau, ***2005-2009 American Community Survey 5-Year Estimates: California*** (Washington, D.C: U.S. Government Printing Office, 2010), Table S2504, "Physical Housing Characteristics for Occupied Housing Units.")

[6] "Energy Upgrade falls far short of goal," ***San Francisco Chronicle*** (September 22, 2012); http://www.sfgate.com/news/article/Energy-Upgrade-falls-far-short-of-goal-3886924.php

The reasons for the disappointing performance are many but clearly homeowner inertia is one significant factor. Even if rebates and other incentives are available, the significant upfront cost is daunting to most homeowners, especially in difficult economic times when many mortgages are underwater.

But there is also significant non-financial inertia. Nearly all homeowners understand that increasing the energy efficiency performance of their home will result in savings on energy bills and increased comfort and health. Despite this, most homeowners can be held back from acting by the potentially intimidating actions required to start the process as well as by the intrusion of strangers into the home. The non-financial inertia is even greater if the homeowner perceives that the energy efficiency upgrade will require lengthy home intrusion over a longer period of time by multiple contractors.

But put simply, the State has two alternatives. The State can quickly make revolutionary changes its energy laws, regulations and policies in order to complete basic energy efficiency retrofits of these 5.6 million older homes in the eight remaining years before 2020. This would entail a run rate of approximately 700,000 per year. Alternatively, the State could abandon the energy efficiency goals in the Long Term Energy Efficiency Strategy and AB 32 Scoping Plan and abide the substantially lower number of retrofits that can be achieved with the existing program as it may be adjusted from time to time.

Significantly Different Approaches Are Needed to Substantially Increase the Number of Residential Retrofits

It seems clear that, if the State is to attempt to meet its energy, environmental, and health goals, significant and rapid changes will be needed to the State's energy laws and policies. The CEC AB 758 docket will be critical in bringing about those changes and two important suggestions are put forth below.

Consider implementing direct installation programs. Given the serious issue of homeowner inertia (financial and non-financial), the CEC should consider endorsing programs that fully or mostly fund basic energy efficiency upgrades. By obviating much of the homeowner inertia, such direct install programs have the promise to significantly increase the number of retrofits completed and energy and emissions saved and prevented prior to 2020.

A good example of a direct install program is the Quality Interiors (QI) proposal to the South Coast Air Quality Management District (AQMD) to mitigate emissions from the planned Sentinel Power Plant in the Coachella Valley (Valley) in eastern

Riverside County, CA. Under AB 1318 (V.M. Pérez),[7] the power plant developers were required to provide a $53 million mitigation fund in lieu of surrendering emissions reduction credits. The QI proposal is available on the AQMD website[8] and a copy is also enclosed with this letter.

QI's experience in performing residential retrofits in the Coachella Valley confirmed that the majority of the homes were constructed prior to the Title 24 energy code and feature approximately 1,200 square feet in a ranch style floor plan. Virtually none have an attic that is air sealed and nearly every home has insufficient levels of attic insulation. This means that during the extended cooling season most homes strain to achieve an acceptable level of comfort at a reasonable cost. For the valley's many senior citizens, discomfort can quickly escalate to a health threat.

Most of the northern half of the valley is a designated environmental justice area, which means that not only are incomes generally low but there are also higher exposures to air pollution.

Under the QI proposal, 4,200 homes would receive a basic energy efficiency upgrade over a period of two years at a total cost of $7.95 million. The upgrades would consist of attic air sealing and adding additional attic insulation up to R-49. Given the widespread energy inefficient condition of the homes in the valley, no energy audits or other diagnostics were proposed. This allowed more money to fund the labor and materials to complete more homes over a shorter period of time. And given the current absence of air sealing and inadequate insulation, it is anticipated that these upgrades will achieve a 20% or greater energy savings, along with improved comfort and health.

As QI has explained to the AQMD, the QI proposal is flexible and scalable. Thus, more or fewer homes could be retrofitted over a shorter or longer period of time by adjusting the funding and schedule.

Ninety percent of the approximate $1,850 cost of a typical upgrade would be paid for by the mitigation fund with the homeowner making a ten percent co-pay. This low cost per project is achieved by performing a large number of projects in a small area, which enables significant cost savings that are shared with the funders, both the AQMD and homeowner.

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[7] See, e.g., ***Report to the Governor and Legislature Interim (Phase 1) Report: AB 1318 South Coast Air Basin Electricity Needs Assessment and Permitting Recommendations***, California Air Resources Board (July 2010); http://www.arb.ca.gov/research/apr/reports/ab-1318-south-coast-air-basin-electricity-needs-assessment-phase1.pdf http://www.aqmd.gov/hb/attachments/2011-2015/2011Jun/2011-Jun3-027.pdf.

[8] http://onbase-pub.aqmd.gov/AppNet/docpop/docpop.aspx

As the proposal explains, the low cost helps to overcome financial homeowner inertia. But having a single contractor that is in the home for only a few hours also helps overcome the significant non-financial homeowner inertia that is especially prevalent among senior citizens. The single contractor can be a single authoritative source to provide quick and reliable answers to any questions. And performing retrofits in a concentrated area will also achieve efficiencies in marketing and encourage word of mouth communication within community networks.

While the AQMD Governing Board has made no final decisions on which of the 75 proposed projects to fund, the AQMD staff has made a preliminary recommendation to award the QI proposal the full $7.95 million as funds allow.[9]

Take steps to build green consumers. A recent article in the Wall Street Journal[10] noted this homeowner inertia phenomenon by stating the following:

> When it comes to saving energy, people aren't irrational. They just seem that way sometimes. Policy makers and executives sometimes think that if they just make it cost-effective for people to save energy, it will happen. But it hasn't—at least not in a big enough way. Households and businesses remain far less energy-efficient than they would be if their decisions followed standard economic principles. So why aren't more people making those investments?
>
> Behavioral-science research shows that there are good reasons for what energy consumers do and don't do. Sometimes it is hard to find reliable information about an energy-saving alternative or its provider, or the process of switching is too complicated, or people aren't convinced that something new will work as well and be as reliable as what they have.
> Most efforts to get people to take the big steps to save energy have failed because they haven't taken these factors into account. The key to changing behavior lies not in the size of financial incentives, but in understanding what else stands in the way of change.

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[9] See Table 3-2 on page 24 of AQMD staff recommendations at http://aqmd.gov/news1/2012/DraftBoardLetterAB1318AdminComm101612-100512.pdf

[10] "Building a Green Consumer," ***The Wall Street Journal*** (September 17, 2012) at page R8; http://online.wsj.com/article/SB10000872396390443792604577572852896507494.html

The article recommends adoption of six basic design principles for energy efficiency programs in order to overcome homeowner inertia:

> **Get people to think big.** You can list 50 ways to save energy, but you can realistically expect consumers to do only one or two things. The trick is to steer them toward the most effective things they can do, partly by highlighting advantages they might not have considered. Insulating and air sealing an energy inefficient house can save far more energy and money than, e.g., resetting the thermostat. But such a basic energy efficiency retrofit can also increase comfort and health. Similarly, buying a fuel-efficient car can save more than cutting back on driving, without sacrificing mobility.
>
> **Make the savings obvious.** Financial incentives have to be big enough to grab people's attention. Most households and even some businesses don't do detailed calculations of return on investment in saving energy—but they can recognize a bargain.
>
> **Market effectively.** Again, you have to grab the attention of busy people. Saturation advertising is one way to do that. Another is word-of-mouth. Some of the most effective programs have relied heavily on word-of-mouth marketing. They started by analyzing community networks and engaging with community leaders and a selection of people likely to be interested in their programs.
>
> **Provide convenient, credible answers.** Information about programs needs to be available when needed, easy to understand, and to come from sources people trust. If they have to turn to unfamiliar sources for answers, they'll be less likely to do anything.
>
> **Keep it simple.** Many programs drive prospective participants away by making them wait or work through multiple steps before they can claim the promised benefits. Immediate gratification—or the nearest thing—works best. For example, sales-tax waivers have been seven times as effective per dollar as income-tax credits in getting people to buy hybrid vehicles.

> **Provide quality assurance.** Consumers have to be confident they will get the promised benefits. This can be a serious barrier for unfamiliar products and services, but even with these, a firm's reputation, a credible guarantee, an independent inspection system, or an arrangement to share both the costs and benefits can be effective.

The QI Coachella Valley proposal satisfies each of these design criteria and should lead to a very high level of participation and community engagement. The program would focus on the two most important energy efficiency performance issues for homes in the Valley and do so in a way that has but a single, experienced and authoritative contractor spend just several hours to make the home more comfortable, more economical to own.

Johns Manville looks forward to continuing participation in the AB 758 docket. If you have any questions, please do not hesitate to contact me. Thank you.

Sincerely,

Bruce D. Ray

Bruce D. Ray
Associate General Counsel

Enclosure

Request for Proposals #P2012-17
Quality Interiors, Inc. (d/b/a Add Insulation, Inc.)
803 East Parkridge Avenue
Corona, California 92879

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

RFP #P2012-17

Coachella Valley Emission Reduction Programs to be Implemented Under the AB 1318 Mitigation Fees Fund

Volume I – Technical Proposal

Presented by ***Quality Interiors, Inc.***
(d/b/a Add Insulation)

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List of Attachments to Volume I: Technical Proposal

1. ***Johns Manville Guide to Sealing Attics and Insulating Existing Homes*** (Johns Manville – 2007).
2. Add Insulation Photos.
3. Quality Interiors/Add Insulation: Licenses, Certifications, and Approval Designations.
4. Levy et al., "*The public health benefits of insulation retrofits in existing housing in the United States*."
5. SCS Certification that the Johns Manville insulation to be used meets the US EPA Region 9/State of California County of Alameda specification criteria for ***Environmentally Preferable Insulation***.
6. Johns Manville insulation product data sheets.

A. Summary

Quality Interiors, Inc., [d/b/a Add Insulation] (Proponent) is a qualified Small Business and Local Business with extensive local knowledge and experience in providing energy efficiency enhancements to existing homes and buildings. Proponent proposes to use 15% of the $53 million mitigation fund ($7,950,000) to achieve significant emissions reductions as well as key public health and economic improvements in the Coachella Valley (Valley) through the energy efficiency retrofit upgrade of approximately 4,200 homes in the Coachella Valley over a period of two years (the Program). Approximately 1,200 homes will be in the six mile radius around the power plant location and the other approximately 3,000 homes will be in environmental justice (EJ) areas in the Valley.

The cost for each retrofit would be funded 90% by the mitigation funds and 10% by the homeowner. Proponent would assist homeowners in qualifying for any applicable utility support program to help defray their 10% cost share amount. Also, as part of the Program, Proponent would invest up to $675,000 of its own funds for warehouse space in the Valley, additional equipment, and advanced training for all new installer employees.

The Program is designed with maximum flexibility in mind. The number of homes to be retrofitted can be increased or decreased as can the time to accomplish the retrofits.

B. Project (Program) Description

1. *Complete description of the proposed Program.*

US EPA and DOE estimate that proper air sealing and attic insulation can achieve on average up to 20% savings on a home's heating and cooling energy requirements. See, for example, "*Air Seal and Insulate with ENERGY STAR*" at http://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_sealing. The actual savings will vary depending on the age of the home and its existing level of air sealing and insulation, with older homes on average being less insulated and less well air sealed and thus providing an opportunity for maximum savings.

The Program would therefore focus on older homes and especially on homes that were built before 1978, when the first version of the State's Title 24 Building Energy Efficiency Standards were adopted. The Valley and especially its AB-1318 designated EJ areas feature many residential developments that were constructed in the 1960s and early 1970s when the Valley became a popular destination during winters, especially for seniors.

Since then, the Valley has nearly universally changed to year-round occupation and the demograpics have evened out, but seniors are still present in numbers that are above average for most cities. These demographic changes, along with

the average age of most homes in the EJ areas, mean that the cooling season is much longer and affects a much larger number of persons, many of whom are especially sensitive to the heat that can be experienced in poorly insulated homes.

US EPA and DOE provide recommendations on the amount of insulation to add to existing homes. See, for example, "*Recommended Levels of Insulation*" at http://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_insulation_table. For DOE Climate Zone 3 (Coachella Valley), it is recommended that R-30 to R-60 be added to an attic with no insulation and that R-25 to R-38 be added to an attic with 3-4 inches of existing insulation.

The Program would target a mid-point in the EPA/DOE recommendation and upgrade insulation in the selected homes to approximately R-49. This would be accomplished by selecting from the following four alternatives:

Amount of existing insulation	**Amount of insulation to be added**
None	R-49
R-11	R-38
R-19	R-30
R-30	R-19

These alternatives were selected as each roughly corresponds to a historic time period when Title 24 required certain minimum insulation amounts in new residential construction.

A comprehensive education, outreach, and marketing program (EOMP) would start within days of approval of the project and would continue throughout the two-year duration of the Program. The EOMP would include at least the following activities:

- in-Valley hired door-to-door sales team to provide on an individual homeowner basis information concerning the energy efficiency upgrade retrofit program and its costs and benefits;
- attendance at city council meetings to educate elected officials and their staff about the Program;
- attendance at meetings of neighborhood, church, and civic organizations to educate the Valley population on the energy efficiency upgrade retrofit program and its costs and benefits;
- purchase of data concerning the homes in the Valley, including year of construction, income level, and other relevant demographic data;
- printing of various pamphlets and documents to educate the Valley population on the energy efficiency upgrade retrofit program and its costs and benefits;

- use of translation services to ensure that those who do not use English as a primary language can fully understand the program.

2. Descriptions of the technologies and methods to be implemented.

Proponent's residential energy efficiency retrofit work will generally follow that depicted in the ***Johns Manville Guide to Sealing Attics and Insulating Existing Homes*** and as shown in the attached Add Insulation photographs. (See attachments 1 and 2 to this Volume I.) The work also follows US EPA recommendations in "*Air Seal and Insulate with ENERGY STAR*" at http://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_sealing.

That work would include the following activities:

a. Air sealing of all ceiling penetrations to attic;
b. Placement of proper insulation dams around recessed lighting fixtures and furnace/hot water heater exhaust and other insulation prep activities;
c. Installation of additional R-49, R-38, R-30, or R-19 of insulation (both batt and loose fill blow in);
d. *Installation of radiant barrier in attic.*

As described in more detail in ***Volume II – Cost Proposal***, it is proposed that activities a. – c. be performed on all selected homes as air sealing and insulation comprise the essential foundation of any residential energy efficiency retrofit. Activity d. will be performed only on those homes where the radiant barrier would be especially effective in reducing home heat gain. Is this way, mitigation funds will be spent in the most cost effective manner.

The precise chronology of actions that would take place for each home are listed below:

- the trained installation crew arrives at the home and presents proper identification to the homeowner/occupant;
- the crew leader explains in detail the work to be done as well as the methods to be used;
- the attic hatch is located and the crew leader inspects the attic to verify that there is no unsafe condition that would preclude the work (e.g., presence of knob and tube electric wiring, presence of animals or other vermin, etc.);

- the crew installs
    a. plastic sheeting from the closest exterior door to the attic hatch;
    b. corner protectors on all corners between the door and the attic hatch;
    c. plastic sheeting drape from the attic hatch towards the floor beneath the attic hatch
- the crew leader makes a quick inventory of all ceiling penetrations that will need to be air sealed in the attic;
- while in the attic, the crew removes the existing insulation, if any, and seals all ceiling penetrations with caulk or foam;
- insulation “dams” are installed around any combustion appliance exhaust pipes and recessed lights;
- vent chutes are installed throughout the attic to allow for airflow from the soffit vents to the attic;
- insulation depth rulers are installed throughout the attic to both aid in installing the proper amount of insulation and to help the homeowner verify the installation;
- a “dam” of batt insulation is installed around the attic hatch to ensure no loose-fill insulation spills out anytime the hatch door is opened in the future;
- between R-19 to R-49 of Johns Manville ClimatePro® loose fill fiber glass insulation is installed in the attic (depending on level of existing insulation, if any) and care will be taken to ensure that the insulation level is uniform throughout the attic;
- the attic hatch is insulated with at least R-38 fiber glass batt insulation;
- the crew leader then inspects the insulation installed possibly along with the homeowner, if he or she wishes, and takes an electronic photo of the attic;
- an installed insulation summary sheet is affixed to the attic rafter above the attic hatch describing the insulation installed;
- the attic hatch is replaced;
- the plastic sheet drape around the attic hatch is carefully removed and taken outside to the equipment truck;
- the plastic sheet between the door and the attic hatch is carefully rolled up behind the crew and removed to the equipment truck as are the corner protectors;
- pursuant to 16 CFR § 460.17 (“What installers must tell their customers”) the crew leader presents the homeowner with a signed receipt and sheet summarizing what work was done and what materials were installed; and,
- the homeowner is congratulated on his or her more energy efficient, cost effective and comfortable home.

3. Project (Program) emission or exposure reductions and secondary benefits.

    a. Emissions Reductions

The RFP properly notes home energy efficiency upgrade retrofit (weatherization) as a project recognized by the AQMD as providing emissions reductions.

After a home energy efficiency retrofit is completed, the home will require much less electricity for heating and cooling. As US EPA has long recognized, the reduction in electricity use from energy efficiency improvements results in emissions reductions of all pollutants at the power plants supplying the electricity. And US EPA has issued and is updating guidance confirming that the end-use energy efficiency Programs result in SIP-creditable utility emissions reductions.

US EPA's 2004 Guidance states at page 1 states:

> EPA supports and wishes to promote the testing of promising new pollution reduction strategies such as energy efficiency and renewable energy measures within the air quality planning process. . . Energy efficiency and renewable energy measures have many benefits. Energy efficiency measures reduce the demand for electricity and renewable energy can supply energy from non- or less-polluting sources. These measures can save money, have other economic benefits, reduce dependence on foreign sources of fuel, increase the reliability of the electricity grid, enhance energy security, and, most importantly for air quality purposes, reduce air emissions from electric generating power plants. Energy efficiency and renewable energy inherently prevent pollution from occurring. Additionally, in many areas, the peak demand for electricity frequently coincides with periods of poor air quality. **It is therefore important to encourage and reward greater application of energy efficiency and renewable energy measures and incorporate the emission reductions that these measures will accrue into the air quality planning process . . .**

"*Guidance on SIP Credits for Emission Reductions From Electric-Sector Energy Efficiency and Renewable Energy Measures*," Air Quality Strategies and Standards Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, (2004) available at http://www.epa.gov/ttncaaa1/t1/memoranda/ereseerem_gd.pdf.

The 2004 Guidance specifically recognizes increasing building energy efficiency via insulation as among the qualifying energy efficiency techniques:

> **What are some examples of specific energy efficiency or renewable energy Programs?**
>
> Such Programs could include, but are not necessarily limited to, the following:
>
> (A) Demand side management energy efficiency Programs, such as: . . .
>
> (2) Programs related to design, construction or reconstruction which by themselves do not use energy, but result in energy savings. For example, reflective roofs, double pane windows, **<u>increased insulation</u>**, and building codes containing these requirements.

2004 Guidance at Section A.1, emphasis added.

In the final Cross State Air Pollution Rule Preamble at Section VIII.D.2.; 76 **Fed. Reg**. 48208, at 48319 (Aug. 8, 2011), US EPA notes that achievement of energy efficiency improvements in homes, buildings, and industry is an important component of achieving emission reductions from the power sector while minimizing associated compliance costs. This is because energy efficiency avoids emissions of all pollutants associated with electricity generation, including emissions of PM10 as well as the NOx/SO2 targeted by CSAPR. Energy efficiency also reduces the need for investments in electricity generating units emission control technologies in order to meet emission reduction requirements. US EPA also noted that energy efficiency can often be implemented at a lower cost than traditional control technologies.

Most recently, US EPA has again recognized the important role played by local end-use energy efficiency in meeting the air quality improvement goals in the Clean Air Act and its state and regional equivalents. In the March 2011 "Roadmap," US EPA states:

> EPA believes it is important to recognize the emission benefits resulting from EE/RE [energy efficiency/renewable energy] policies and programs in SIPs and TIPs. Therefore, EPA is encouraging state, tribal and local agencies to incorporate EE/RE policies into SIPs/TIPs (or to account for them in SIPs/TIPs) because these policies represent a real opportunity for state, tribal and local air quality planners to take advantage of the emission benefits of the policies. Three reasons are:

1) Over the past 10 years, states have increased their EE/RE investments by 209 percent, committing over $3 billion of ratepayer resources in 2009 to energy efficiency programs.5 (See Figure 1.1 for ratepayer EE expenditures from 2000-2009.) Also, as of 2009, thirty states (including Washington, DC) had adopted renewable portfolio standard (RPS) which require their utilities to purchase increasing amounts of their electricity supply from renewable resources, more than double the number states in 2000 (see Figure 1.2).

2) EPA has issued revised National Ambient Air Quality Standards for ozone, SO2, PM2.5 and NO2 that continue to drive the need to find greater emission reductions. EPA is encouraging state, tribal and local agencies to incorporate EE/RE policies and programs into SIPs/TIPs as they face a need to find greater pollutant reductions from the electric power generation sector to meet these revised standards. Moreover, the availability of EE permits the state, tribal and local agencies to diversify the control measures being considered beyond the traditional measures considered for point sources.

3) Improved precision and rigor for information related to the energy savings from energy efficiency, what generation resources are displaced by EE/RE and their resulting emissions benefits is more widely available so state, tribal and local agencies do not have to start analyses from scratch.

"*Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State Implementation Plans/Tribal Implementation Plans*," U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Outreach and Information Division Research Triangle Park, North Carolina (March 2011) at page 8. (Available at http://www.epa.gov/airquality/pdfs/eeremanual.pdf)

Finally, the American Council for an Energy Efficient Economy (ACEEE) in January 2012 released a whitepaper that strongly endorses end-use energy efficiency as a cost-effective method to achieve emissions reductions required by US EPA Clean Air Act regulations. According to ACEEE's **Energy Efficiency: The Slip Switch to a New Track Toward Compliance with Federal Air Regulations** (ACEEE, Jan. 2012) – there are "***multiple opportunities for energy efficiency to play a role in federal air regulations. Whether efficiency is a means of direct compliance or a complementary tool to reduce cost of compliance . . . efficiency can ensure we find the lowest cost approach to cleaning the air***." Emphasis added.

b. Secondary Benefits

Especially during the extended cooling season in the Coachella Valley, the retrofitted homes will require less electricity to achieve and maintain the required comfort temperature. Since many temperature-sensitive senior citizens reside in the Valley, energy efficiency improvements will also result in health improvements for many. This should translate into fewer emergency room visits and acute condition doctor visits.

Lower electricity use will result in lower power bills, which in turn will result in homeowners having more cash available to spend on additional goods and services, most of which are likely to be sourced in the Valley. This will have a beneficial economic impact throughout the Valley and should result in additional employment.

An energy efficient home is worth more than an inefficient one. Therefore, energy efficiency retrofitting homes should increase in value resulting in beneficial economic impact in the Valley.

4. Estimated job creation resulting from the Program and portion occurring in the Coachella Valley.

It is Proponent's intent to hire up to 20 additional employees to complete the proposed Program. Although the Program itself would last only two years, it could well be that Proponent will consider retaining indefinitely both the employees and the newoffice space if business conditions are favorable. The training that will be provided to new installer employees goes well beyond a temporary program and readies the new employee for a vocational career in insulation installation – both new construction and retrofit.

The employees that Proponent intends to hire include the following:

- 1 office manager
- 4 sales people
- 15 installers

C. Statement of Work

1. Experience and expertise, evidence of capacity to complete the Program.

Proponent Quality Interiors is one of the most experienced insulation and home energy efficiency contractors in Southern California and the southwest United States. Proponent has been successfully retrofitting homes in Southern California, including the Valley, for over 30 years and the Quality principals have a combined insulation and retrofitting experience of over 130 years. Proponent has installed insulation in approximately 75,000 homes over the past 30 years.

In the past five years, Proponent has air sealed and installed insulation in over 5,000 homes in Southern California, with approximately 500 of those homes being in the Coachella Valley.

As also shown in Attachment 3, Proponent has all required licenses to perform all the work proposed and is fully insured. Proponent also features an operations manager and several existing installers who are certified by the Building Performance Institute (BPI), perhaps the nation's most important insulation and energy efficiency qualifications and certification body. Proponent is also an approved installer under the following programs or sponsors:

- Energy Upgrade California
- Southwest Gas and Electric
- San Diego Gas & Electric (SDG&E)
- Southern California Edison (SCE)
- Southern California Gas
- Pacific Gas & Electric (PG&E)
- Riverside Public Utilities
- California Department of Parks and Recreation

Upon request, the South Coast AQMD will be named an additional insured under Proponent's insurance.

Quality currently has or will invest its own money to acquire all the necessary equipment to successfully retrofit at least 4,200 homes in the Valley over the proposed two-year period. And quality uses only experienced installers that have been subject to the rigorous vetting and background check required by both Johns Manville as well as Lowe's. (Proponent serves an approved "do-it-for-me" insulation contractor for the many Lowe's locations in Southern California.)

Proponent is prepared to invest up to $675,000 of its own funds in order to better serve the Valley during the Program. This investment would include new warehouse and office space in the Valley, four additional equipment trucks and a new pickup truck (one of which would be a hybrid), extensive new employee training.

2. Complete description of the emission reduction project as well as the potential emission reductions and public health benefits resulting from the Program.

The residential energy efficiency emissions reduction Program is described in detail above.

The public health benefits from adding insulation to existing homes is well documented. A study performed by the Harvard University Graduate School of Public health in 2003 investigated the health benefits if the under-insulated homes in the US were brought up to just International Energy Conservation Code (IECC) 2000 standards. Levy et al., "*The public health benefits of insulation retrofits in existing housing in the United States*," 2 **Environmental Health** 4 (2003) - copy attached. According to the study's abstract -

Methods: We modeled energy savings with a regression model that extrapolated findings from an energy simulation program. Reductions of fine particulate matter (PM2.5) emissions and particle precursors (SO2 and NOx) were quantified using fuel-specific emission factors and marginal electricity analyses. Estimates of population exposure per unit emissions, varying by location and source type, were extrapolated from past dispersion model runs. Concentration-response functions for morbidity and mortality from PM2.5 were derived from the epidemiological literature, and economic values were assigned to health outcomes based on willingness to pay studies.

Results: In total, the insulation retrofits would save 800 TBTU (8×10^{14} British Thermal Units) per year across 46 million homes, resulting in 3,100 fewer tons of PM2.5, 100,000 fewer tons of NOx, and 190,000 fewer tons of SO2 per year. These emission reductions are associated with outcomes including 240 fewer deaths, 6,500 fewer asthma attacks, and 110,000 fewer restricted activity days per year. At a state level, the health benefits per unit energy savings vary by an order of magnitude, illustrating that multiple factors (including population patterns and energy sources) influence health benefit estimates. The health benefits correspond to $1.3 billion per year in externalities averted, compared with $5.9 billion per year in economic savings.

Conclusion: In spite of significant uncertainties related to the interpretation of PM2.5 health effects and other dimensions of the model, our analysis demonstrates that a risk-based methodology is viable for national-level energy efficiency programs.

3. The timeline for implementation of the emission reduction Program, including major tasks and milestones.

Proponent's timeline for major tasks and milestones would be as follows (expressed in days after Program is approved and contract signed):

- 3 days – order insulation and air sealing materials;
- 3 days – commence education and outreach program;
- 15 days – commence retrofit work;
- 30 days – final lease for office space and warehouse;
- 30 days – purchase equipment trucks;
- 30 days – purchase hybrid pickup;
- 183 days – complete 630 retrofits;
- 363 days – complete 1,344 add'l retrofits (1,974 total);
- 543 days – complete 1,386 add'l retrofits (3,360 total);
- 723 days – complete 840 add'l retrofits (4,200 total).

This schedule shows that there will be a ramp-up period early in the program but Proponent is capable and fully prepared to commence actual retrofit work within only days after the Program is approved.

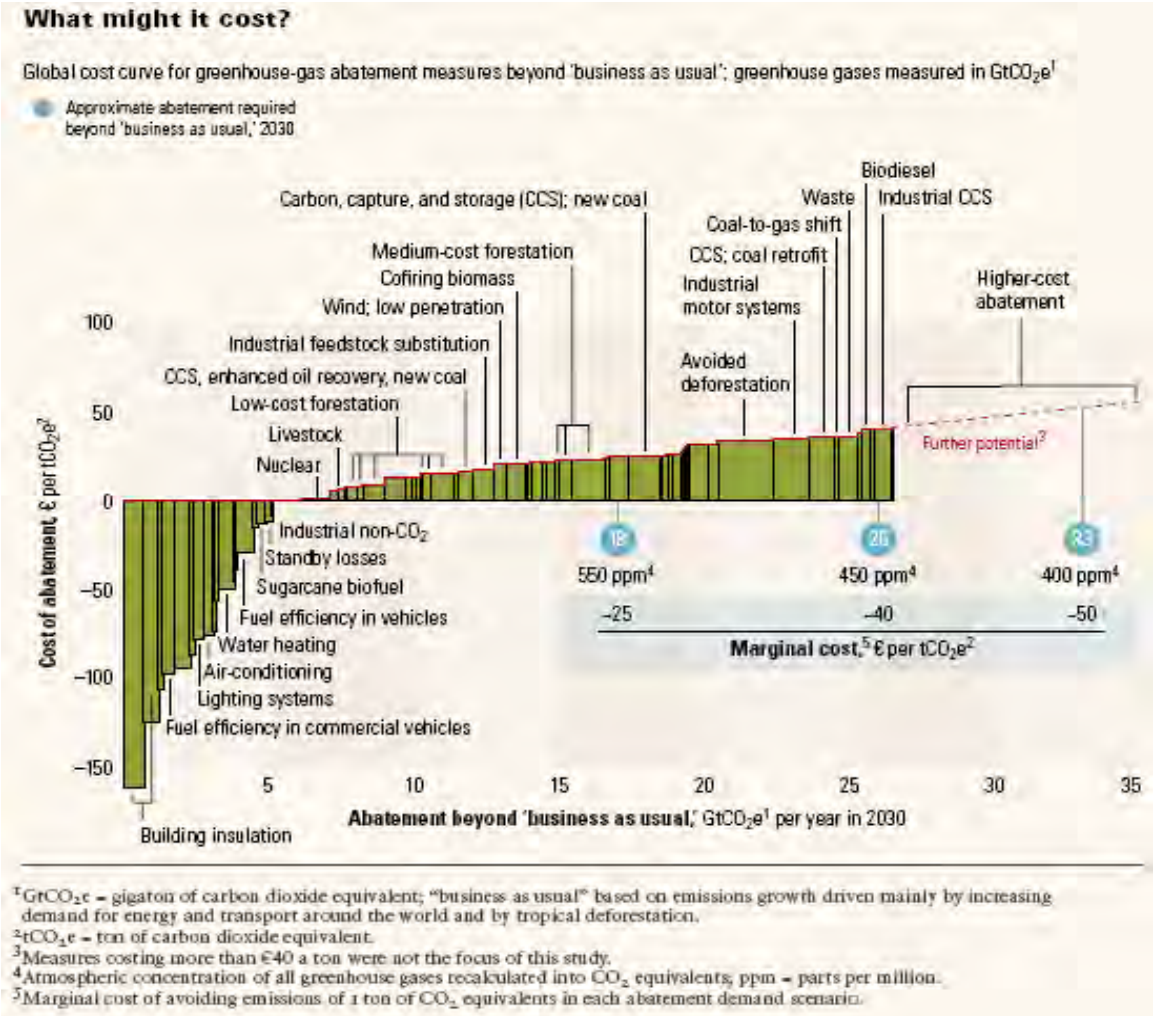
4. How the Program meets or further advances the AQMD's regional air quality attainment and public health protection goals.

The overarching goal of the Program is to assist the AQMD in demonstrating further progress towards achieving throughout the Coachella Valley the National Ambient Air Quality Standard (NAAQS) for PM10 – fine particulates. In addition, the Program will achieve reductions in the emissions of other pollutants such as greenhouse gas emissions, NOx, and SO2. These emission reductions are consistent with and support the AQMD's **2003 COACHELLA VALLEY PM10 STATE IMPLEMENTATION PLAN** available at http://www.aqmd.gov/aqmp/docs/f2003cvsip.pdf.

5. Demonstration of effective use of the funds.

Energy efficiency can deliver emissions reductions (and energy "generation") in increments smaller than large abatement devices or fuel switching at utility plants, allowing for greater flexibility. And several studies by McKinsey & Company confirm that energy efficiency is perhaps the cheapest and quickest method to reduce greenhouse gas (GHG) emissions. The compelling "McKinsey Curve" below depicts that, among the array of all GHG emission reduction techniques, energy efficiency from building insulation (both new construction and retrofit) is one of very few techniques that can reduce GHG emissions at "negative cost," *i.e*., energy efficiency simultaneously reduces GHG emissions, saves energy and saves money. The curve can be found in "*A cost curve for greenhouse gas reduction*," **The McKinsey Quarterly** (2007) available at http://www.mckinseyquarterly.com/A_cost_curve_for_greenhouse_gas_reduction_1911.

Although the McKinsey study was done for GHG emissions, it provides support for how energy efficiency reduces emissions of other pollutants, including PM10 and air toxics present in the Valley.



[1]$GtCO_2e$ = gigaton of carbon dioxide equivalent; "business as usual" based on emissions growth driven mainly by increasing demand for energy and transport around the world and by tropical deforestation.
[2]tCO_2e = ton of carbon dioxide equivalent.
[3]Measures costing more than €40 a ton were not the focus of this study.
[4]Atmospheric concentration of all greenhouse gases recalculated into CO_2 equivalents; ppm = parts per million.
[5]Marginal cost of avoiding emissions of 1 ton of CO_2 equivalents in each abatement demand scenario.

6. Breakdown of costs per task or milestone over the course of the Program.

Reference is made to **Volume II – Cost Proposal** for this information and data.

7. Support from the local and/or regional community for the Program, such as letters of support or other correspondence

Letters of support are pending.

D. Program Schedule

See section C.3., above.

E. Program Organization

The Program will use the existing successful organization of Quality Interiors, which puts the Proponent owner/principals in charge of the overall Program, including directing retrofit crew leaders, who then supervise individual installer crew members.

F. Qualifications

See Paragraph G.5, below.

G. Assigned Personnel

1. List of key Quality/Add Insulation personnel assigned to the Program.

    - Rick Merigold, President: 33 years managing and/or owner of residential new construction and retrofit insulation companies. BS degree from San Diego Sate University.
    - Bill Mickle, Project Manager: 35 years in the new construction and retrofit insulation industry. 7 years managing the PG&E and SDG&E low income energy conservation programs for Western Insulation. BPI certified. OSHA 30 hour certification.
    - Steve Troth, Project Director: 25 years in residential retrofit insulation and mechanical/industrial insulation industry. 8 years as the Western Regional Manager for Johns Manville. Managed up to 450 employees in sales, marketing, engineering and manufacturing.
    - Carlos Sanchez, Field Supervisor: 15 years in the new construction and retrofit insulation industry. Experienced in all aspects of blown and batt insulation, including installations of attic, wall insulation.
    - Levi Brown, Field Supervisor: 3 years in the residential retrofit insulation industry. 5 years experience running his own residential weatherization company. 5 years working for a general contractor as a journeyman carpenter.
    - Jack Villanueva, Sales Supervisor and Trainer: 25 years in the residential retrofit insulation and HVAC business. A sales professional and trainer having trained dozens of successful sales people.

2. Spreadsheet of the labor hours proposed for each labor category at the task level.

    Reference is made to **Volume II – Cost Proposal** for more specific information.

3. Estimated time to be spent by the lead person and key persons assigned to the Program.

    - Rick Merigold 15%
    - Bill Mickle 50%
    - Steve Troth 50%
    - Jack Villanueva 100%
    - Carlos Sanchez 100%
    - Levi Brown 100%

4. Statement indicating whether the Program qualifies or partially qualifies for the EJ area funding or the close proximity funding, or both, and demonstrating that the Program is within the geographical boundaries of the Coachella Valley.

   All retrofit work will be done in the Coachella Valley. 1,200 homes in the six-mile radius will be retrofitted. The remaining 3,000 proposed to be retrofitted are in the designated EJ area.

5. Summary demonstrating that Proponent meets the required qualifications and can fulfill the statement of work.

Proponent Quality Interiors is one of the most experienced insulation and home energy efficiency contractors in Southern California and the southwest United States. Proponent has been successfully retrofitting homes in Southern California, including the Valley, for over 30 years and the Quality principals have a combined insulation and retrofitting experience of over 130 years. Proponent has installed insulation on approximately 75,000 homes over the past 30 years.

As also shown in Attachment 3, Proponent has all required licenses to perform all the work proposed and is fully insured. Proponent also features an operations manager and several existing installers who are certified by the Building Performance Institute (BPI), perhaps the nation's most important insulation and energy efficiency qualifications and certification body. Proponent is also an approved installer under the following programs or sponsors:

Quality has all the necessary equipment and materials to successfully retrofit 4,200 homes in the Valley over the proposed two-year period. And quality uses only experienced installers that have been subject to the rigorous vetting and background check required by both Johns Manville as well as Lowe's. Proponent is an approved "do-it-for-me" insulation contractor for Lowe's.

H. Subcontractors

None.

I. Conflict of Interest

Proponent has no conflicts of interest.

J. Rights in Technical Data

None.

K. Additional Information

a. *Materials to be Used*

Proponent will use Johns Manville (JM) Formaldehyde-free™ fiber glass building insulation (FGBI). The JM FGBI to be used is certified by an independent third party to meet the US EPA Region 9/State of California County of Alameda criteria for ***Environmentally Preferable Insulation***. (See certificates attached to this Volume I.) Also attached are product data sheets for these insulation products.

In addition, all JM FGBI features biosoluable glass fibers that are **not** listed in either the California Proposition 65 List or the 12th Report on Carcinogens (NTP/HHS).

Fiber glass insulation is proposed to be used for several reasons. First, unlike cellulose insulation, fiber glass is naturally fire resistant without the need to add fire-retardant chemicals. Second, fiber glass insulation is much lighter than cellulose for a given R-value. This can be quite important for homes such as many in the Valley with thinner ceiling drywall (e.g., < ½" thickness) that could be strained by R-38 cellulose. Finally, all fiber glass batts that would be used are made in California at the JM facility in Willows, California (Glenn County).

b. *Program Evaluation Criteria and Additional Points*

The proposed Program addresses and qualifies for all the Program Evaluation Criteria and most Additional Points set forth in the RFP. Specifically:

Experience and expertise of Proposer or other evidence of capacity to complete the Program: Proponent has over 30 years of insulation and energy efficiency and retrofit experience in Southern California.

Aids in achievement of AQMD's regional air quality goals in Coachella Valley and/or promotes long-term emission reduction technologies/strategies associated with state/federal regulatory clean air plans: using energy efficiency as an emissions reduction method is recognized by US EPA and is consistent with the **AQMD Air Quality-Related Energy Policy (September 9, 2011).**

Job creation within in the Coachella Valley: Program will create up to 20 direct jobs in the Valley; there should also be increased indirect jobs as a result of the beneficial impacts of the Program in the Valley.

Effective use of funds: studies show that end-use energy efficiency is typically the fasted and cheapest way to achieve emissions reductions in the utility sector, while also generating important "side benefits" related to health and

comfort, job creation and economic activity, enhancement of home values.

Secondary benefits, other than jobs: these would include health and comfort of home owners and occupants, economic activity and enhancement of home values.

Community/government support: pending.

Additional Points

Small Business or Small Business joint venture: Quality Interiors qualifies as a Small Business as defined in the RFP at IV.7.a. at page 6.

Low-emission vehicle business: Proponent would use its own funds to purchase a hybrid pickup truck for the Program.

Local business (Non-EPA funded Programs only): Proponent has been based in Corona, CA for over 12 years, but in Southern California for over 30 years.

CHECK YOUR FILL LOWER YOUR BILL™

Johns Manville Guide to Sealing Attics and Insulating Existing Homes

Johns Manville

Formaldehyde FREE

JM Formaldehyde-free™ building insulation

JM Formaldehyde-free™ fiber glass insulation delivers superior thermal and acoustical performance for the life of your home and improves indoor air quality because it's made without formaldehyde. We care about the health and well being of those in the homes we insulate. That's what motivates us to develop innovative new products that make homes more comfortable, safer and healthier for those inside. We removed formaldehyde from our insulation because it was the smart thing to do.

JM Formaldehyde-free™ fiber glass insulation does even more. It helps the environment because we use more than twice the certified post-consumer recycled content of any other major fiber glass insulation manufacturer. We incorporate an average of 25% recycled content—at least 20% glass from recycled bottles from curbside recycling programs and the remainder from post-industrial glass—across North America.* And since it's made without formaldehyde, there are no binder-related formaldehyde emissions coming from our plants during manufacturing. Our fiber glass manufacturing plants are so "clean," they're the only ones exempt from EPA Hazardous Air Pollutant regulations.

* Recycled content is certified by Scientific Certification Systems.

Adding insulation and sealing air leaks is the quickest, cheapest way to a more energy-efficient home.

Use this guide to:

1. Learn how to find and seal hidden attic air leaks

2. Determine if there's enough insulation in the home, and find out how to add more to:
   - Attic
   - Basement
   - Crawl spaces
   - Floors
   - Exterior walls and garages

3. Make improvements safely and effectively

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Locating Air Leaks	3
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Sealing Attic Air Leaks	9
Additional Sources of Attic Air Leaks	16
Adding Insulation	18

Homeowners may have already noticed air leaks around windows and doors, but often the more significant leaks into the attic are harder to detect. These are the leaks that raise energy bills and make homes uncomfortable. In cold weather, attic air leaks act like a chimney, drafting expensive heated air up into the attic and sucking cold air in all around the home—around windows, doors and the rim joists. In hot weather, the opposite occurs. Check for leaks around plumbing fixtures, light fixtures, chimneys, soffits and chaseways, which are often hidden under insulation.

An easy way to find an air leak is to hold a tissue between two fingers near the area and the draft will move the tissue. You can also use a lighted smoke pencil or incense stick.

Stopping the chimney effect

Outside air drawn in through basement leaks is worsened by the "chimney effect" created by leaks in the attic. As hot air generated by the furnace rises up through the house ❶ and into the attic through leaks ❷, cold outside air gets drawn in through basement leaks to replace the displaced air ❸. This makes the home feel drafty and raises energy bills. By sealing attic air leaks, you are stopping the chimney effect. It is like closing the end of a straw.

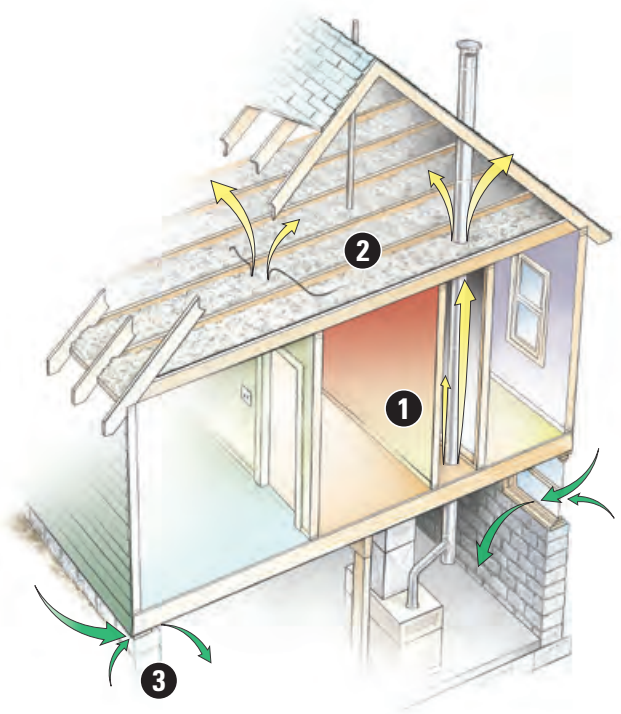
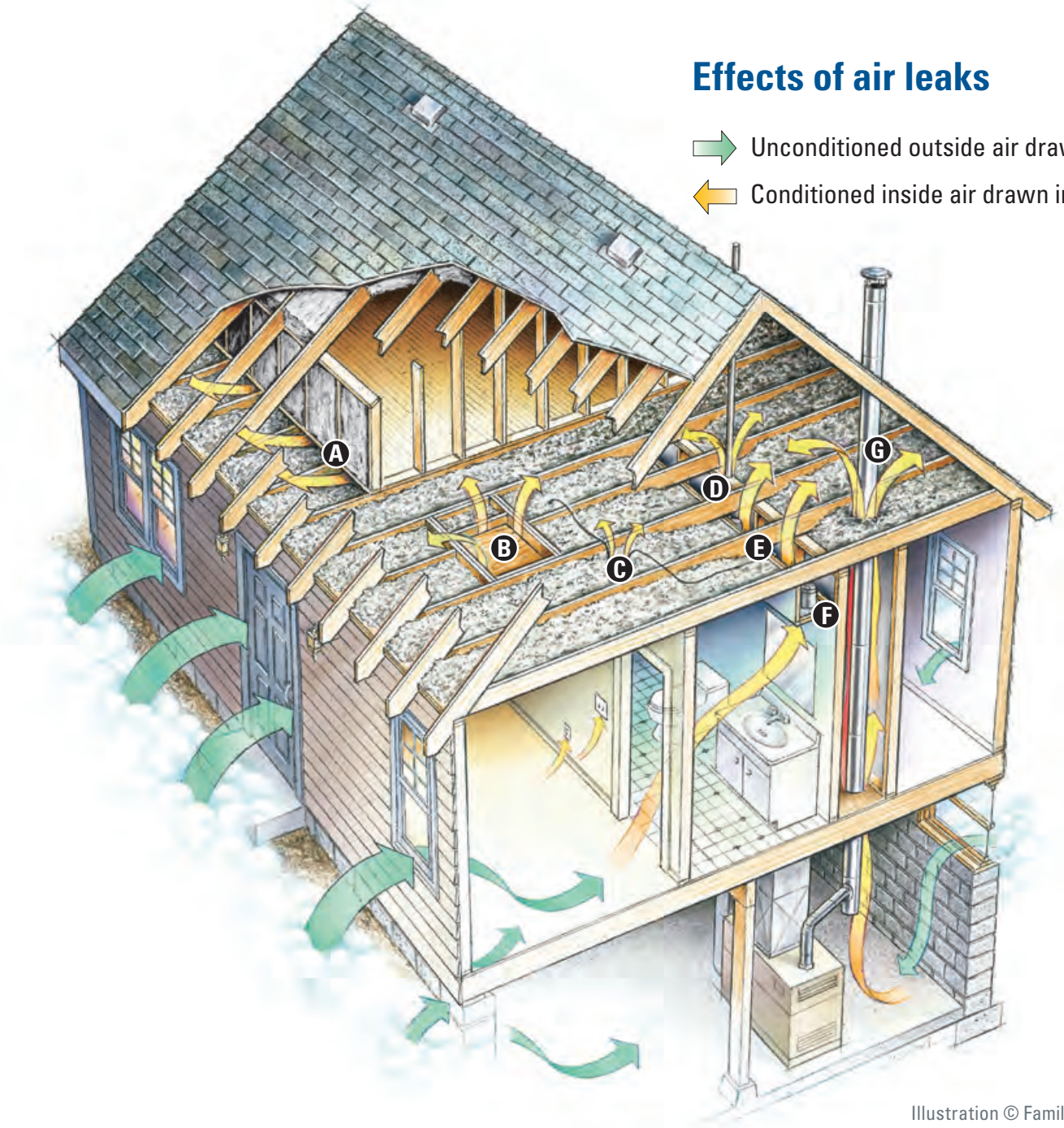


Illustration © Family Handyman Magazine

Caution: When sealing the furnace pipe (which will be encased in a metal sleeve), use high-temperature caulk. Run a bead of high-temperature caulk around the pipe sleeve and around the metal frame.



Effects of air leaks

Unconditioned outside air drawn into the house

Conditioned inside air drawn into the attic

Illustration © Family Handyman Magazine

Common attic air leaks

- **A** Between floor joists behind kneewalls
- **B** Attic hatch
- **C** Wiring holes
- **D** Plumbing vent
- **E** Open soffit (the box that hides recessed lights and the finished space above cabinets)
- **F** Recessed light
- **G** Furnace flue

LOCATING UNDER-INSULATED AREAS

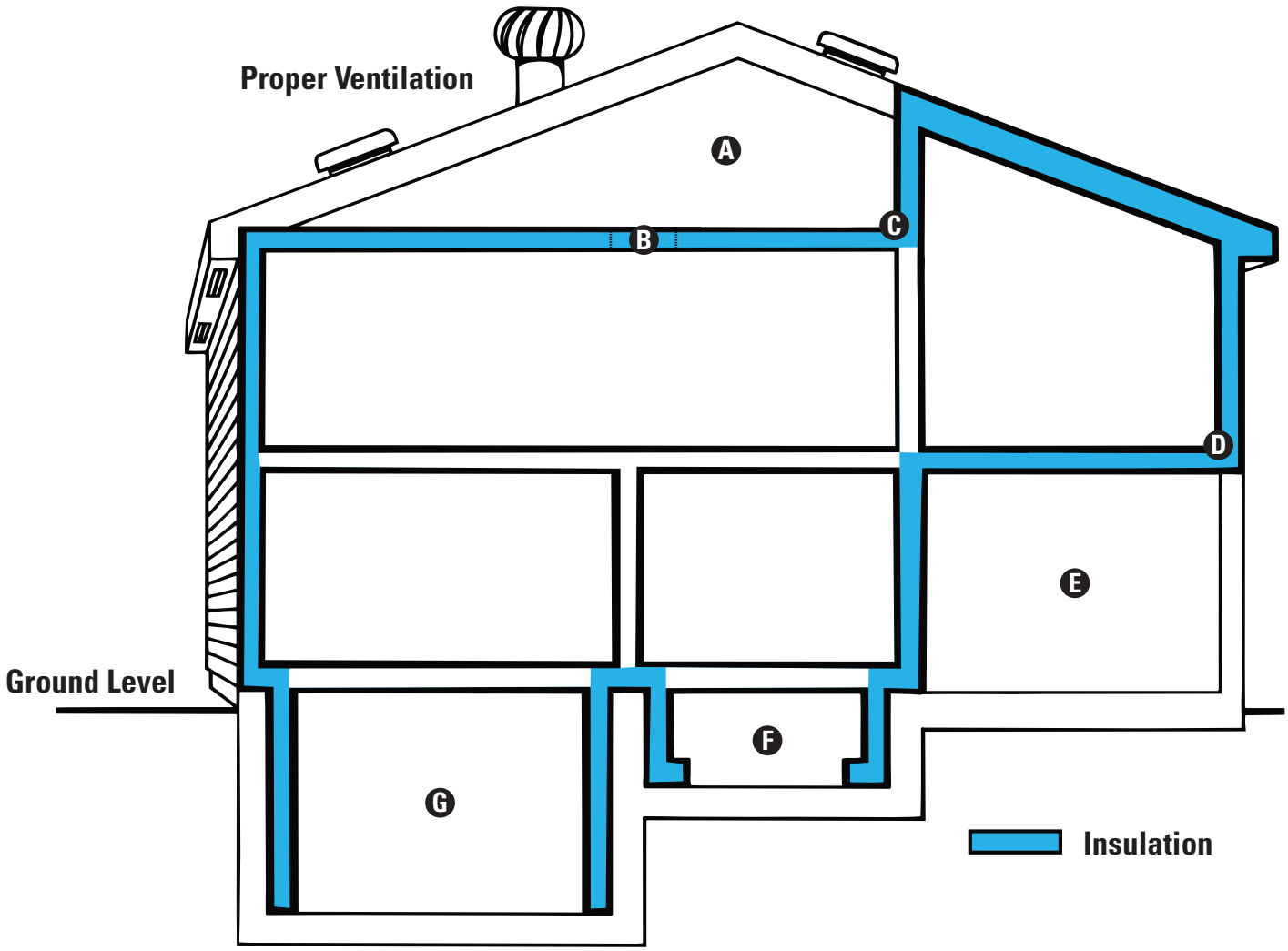
Locating under-insulated areas

- Attic – To measure the insulation, slide a yardstick or tape measure into the insulation.
- Basement – Check rim joists and basement walls.
- Crawl spaces – Check between floor joists if vented, and check perimeter walls if unvented. Ground should be covered with a 6 mil polyethylene sheet.
- Exterior walls and floors – Check by removing an electrical outlet cover after turning off the electricity.
- Garage – Check garage walls and ceilings that are adjacent to conditioned spaces.
- Knee walls – Check behind kneewalls.

Effects of under-insulated or uninsulated areas

Heat can easily pass through uninsulated areas or insulation that's too thin, causing the air temperature in the house to be uncomfortable. Sound will also easily pass through uninsulated areas, making the house noisier.

Even if the home has adequate insulation, sealing air leaks will enhance the performance of the insulation and make the home much more comfortable.



Common areas for adding insulation

- **A** Attic
- **B** Attic hatch
- **C** Behind kneewalls
- **D** Exterior walls and floors
- **E** Garage
- **F** Crawl space
- **G** Basement

Special problems to look for

- Wet or damp insulation, which indicates either a leaky roof, or that warm air from below is coming into the attic and condensing on the cold attic ceiling
- Kitchen or bathroom exhaust vent ducts that vent moist air into the attic instead of to the outside
- Ask the homeowner if they get ice dams (where snow melts and re-freezes at the roof edge or gutters), indicating serious air leaks
- Little or no attic ventilation (see pg. 19, A note about attic ventilation)
- Knob-and-tube wiring (pre-1930), which can be a fire hazard if it touches insulation
- Many recessed can lights in the attic floor, which require special attention (see pg. 17)

Get your bearings from below

Ask the homeowner to make a rough sketch of the home's floor plan to help you locate leaks once you're in the attic. Ask the homeowner to take you on a tour of the home and be sure to note the following areas:

- Dropped soffits over kitchen cabinets or bath vanities
- Slanted ceilings over stairways
- Areas where interior or exterior walls meet the ceiling
- Any other dropped-ceiling areas
- Ceiling fixtures and recessed lights
- Wall switches for ceiling fixtures

These areas may have open stud cavities leading directly into the attic and are huge sources of air leaks (see photos 1-3 on pp. 9 and 10).

Tips for working in the home

Be safe and wear the right gear

- Knee pads will help keep you comfortable while crawling on attic joists.
- If the weather's warm, try to start early, since attics heat up as the day goes on
- Drink plenty of water
- Watch your step—walk on ceiling joists or truss chords, not the ceiling drywall
- Follow NAIMA-OSHA Health and Safety Partnership requirements for personal protective equipment (PPE) as listed. Wear long pants, a long-sleeved shirt, hat, eye protection, respirator (OSHA N-95 dust mask) and gloves.

Materials checklist for sealing attic air leaks and adding insulation to the home

- ☐ JM Formaldehyde-free™ fiber glass insulation
- ☐ Large garbage bags for stuffing open stud cavities behind kneewalls and in dropped soffits
- ☐ Drywall, pieces of rigid foam insulation or other blocking material to cover soffits, open walls and large holes
- ☐ Silicone caulk and caulk gun for sealing small holes (¼-inch or less)
- ☐ Expanding spray foam insulation for filling larger gaps (¼-inch to 3 inches)
- ☐ Special high-temperature silicone caulk to seal around flues and chimneys
- ☐ Roll of at least 14-inch wide aluminum flashing to keep insulation away from flue pipe
- ☐ Retractable utility knife and sheet metal scissors
- ☐ Tape measure and staple gun or hammer and nails to hold covering materials in place
- ☐ Flashlight or portable safety light
- ☐ Boards to walk on if needed
- ☐ Large bucket to haul materials
- ☐ Small rake for evening out existing loose fill insulation
- ☐ Furring strips if necessary
- ☐ Vent chutes
- ☐ ***Reminder***: Follow NAIMA-OSHA Health and Safety Partnership PPE requirements as listed. Wear long pants, a long-sleeved shirt, hat, eye protection, respirator (OSHA N-95 dust mask) and gloves.

Plug the big holes first

Although you must seal small cracks because conditioned air escapes through them, the biggest savings will come from plugging the largest holes, so start there. Once in the attic, look at the sketch to locate the areas where leakage is greatest:

- Where interior and exterior walls meet the attic floor
- Soffits and other dropped-ceiling areas
- Behind attic kneewalls

Look for dirty insulation—this indicates that air is moving through it. Soffits may be filled with insulation or covered with cardboard or fiber glass batts. Push back the insulation and scoop it out of the soffits. You can put the insulation back over the soffit once you have plugged the stud cavities and covered the soffits (photos 1 - 3). (If there are recessed can lights in the open soffits, please read about them on page 17 before proceeding.)

1. Create stuffed bags

Cut a 16-inch long piece from a batt of JM unfaced insulation and fold it at the bottom of a 13-gallon plastic garbage bag.

2. Plug open stud cavities

Fold the bag and stuff it into the open stud cavity. Add more insulation to the bag it if doesn't fit tightly. Plug all open stud spaces, then cover the soffit (photo 3, pg. 10).

3. Cover soffits and chaseways

Cut a length of drywall or other blocking material about 6 inches longer than the opening you want to cover. You may need to add furring strips around the opening to support semi-rigid blocking materials. Apply a bead of silicone caulk around the opening. Embed the drywall in the caulk and staple or nail it in place if needed. Cover the area with insulation.

4. Seal kneewalls

Cut a 24-inch long piece from a batt of JM fiber glass insulation and place it at the bottom of a 13-gallon plastic garbage bag. Fold the bag over and stuff it into the open joist spaces under the wall. Again, cover with insulation when you're done.

If the attic is finished, seal behind the kneewall

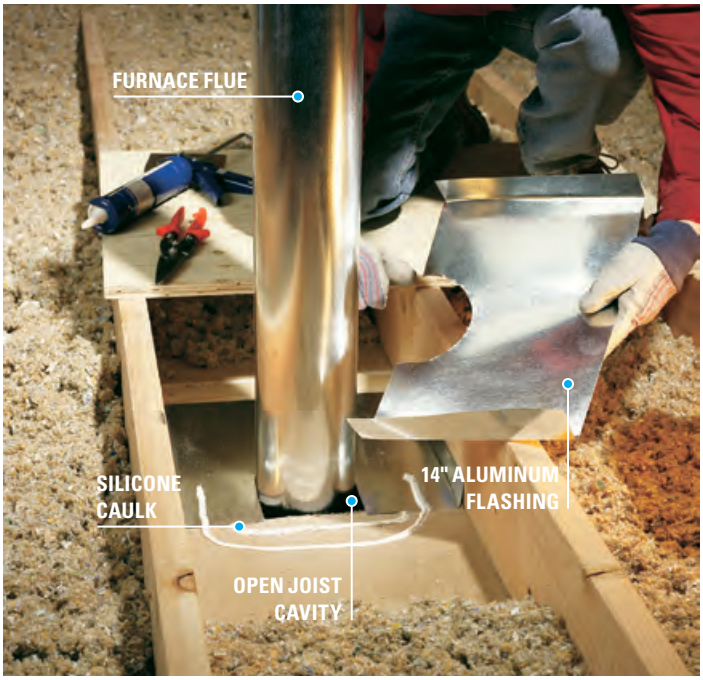
Finished rooms built into attics often have open cavities in the floor framing under the side-walls or kneewalls. Even though insulation may be piled against or stuffed into these spaces, they can still leak air. Again, look for dirty insulation, a clear indication that air is moving through. You need to plug these cavities to stop the air from traveling under the floor of the finished attic.

Caution: Some attics have vermiculite insulation, which may contain asbestos, a health hazard. Vermiculite is a lightweight, pea-sized, flaky gray mineral. Don't disturb vermiculite insulation unless it's been tested by an approved lab to be sure it doesn't contain asbestos. Contact your local health department for the name of an approved lab.

Furnace flues require special sealing techniques

The opening around a furnace or water heater flue or chimney is a major source of warm air into the attic. Because the pipe gets hot, building codes require 1 inch of clearance from metal flues (2 inches from masonry chimneys) to any combustible material and insulation. Photos 5 and 6 show how to seal this gap with lightweight aluminum flashing and special high-temperature silicone caulk. Before you push the insulation back into place, build a metal dam (photo 7) to keep it away from the pipe. Use this technique for masonry chimneys too.

5. Cut aluminum flashing



Cut aluminum flashing to fit around the flue. For round flues, cut half circles out of two pieces so they overlap about 3 inches in the middle. Press the flashing metal into a bead of silicone caulk and staple, screw or nail it into place. If there's no wood, staple or nail it directly to the drywall, but be sure not to go through the drywall.

6. Seal with high-temp silicone caulk

Seal the gap between the flue and metal flashing with special high-temperature silicone caulk. Don't use expanding foam.

7. Form an insulation dam

Make an insulation "dam" to keep the existing insulation from touching the flue pipe.

1. Cut enough aluminum from the coil to wrap around the flue, plus 6 inches extra.
2. Cut slots 1 inch deep and a few inches apart along the top and bend the tabs in.
3. Cut slots about 2 inches deep along the bottom and bend the tabs out.
4. Wrap the dam around the flue and secure the bottom by stapling or screwing through the tabs.
5. Put insulation back right up against the dam.

Identifying attic pipes

FLUES/VENTS/PIPES:	MADE OUT OF:	SEAL AROUND WITH:
Furnace/Water heater	Galvanized metal	Aluminum flashing and high-temperature silicone caulk
Chimney	Masonry	Aluminum flashing and high-temperature silicone caulk
Plumbing	Cast iron or PVC	Expanding foam or caulk, depending on size of gap

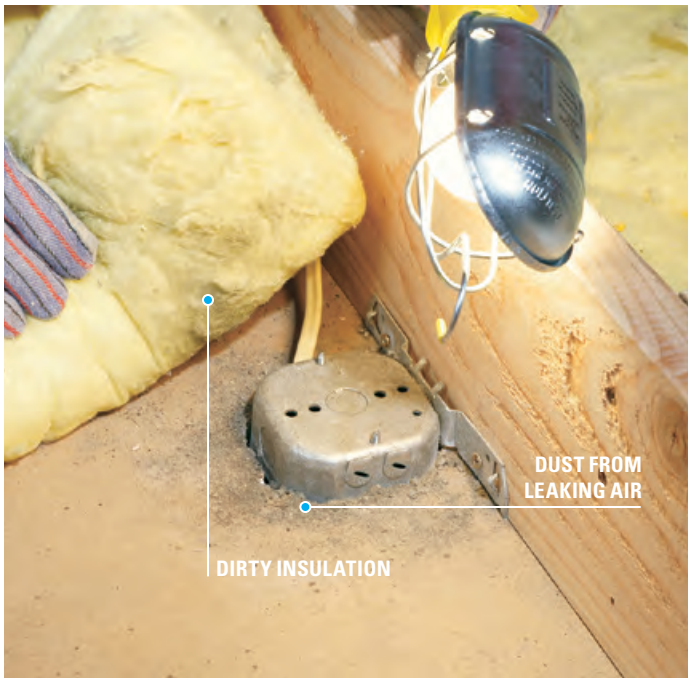
Foam or caulk small gaps in the attic

Telltale signs of small gaps in the attic:

- Insulation is darkened or dirty (see photo 8). This happens when dusty air from the house filters up through the insulation
- In cold weather, frosty areas on insulation caused by warm, moist air from below condensing and freezing as it hits the cold attic air
- In warmer weather, water stains on the framing or drywall from condensation or melting wintertime frost in insulation caused by the moist air leaking into the attic

If the insulation is dirty but dry, it's okay to use. However, you need to replace any wet insulation. After sealing the areas, just push the insulation back into place. If there's loose fill insulation, use a small rake to level it back into place or blow additional insulation into the attic.

8. Find attic bypasses

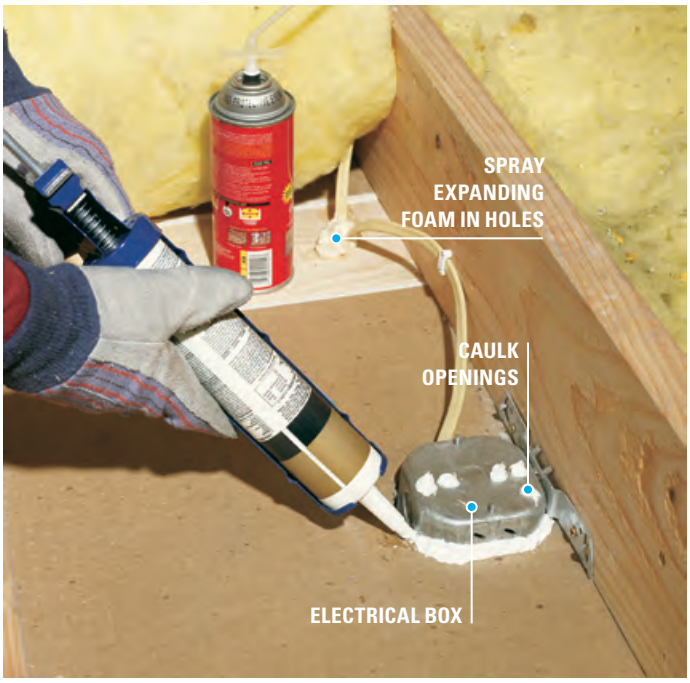


Check for gaps in the attic by looking for dirty insulation. Seal the gaps with silicone caulk or expanding foam. When complete and dry, push the insulation back into place.

Seal around vents, pipes and wires

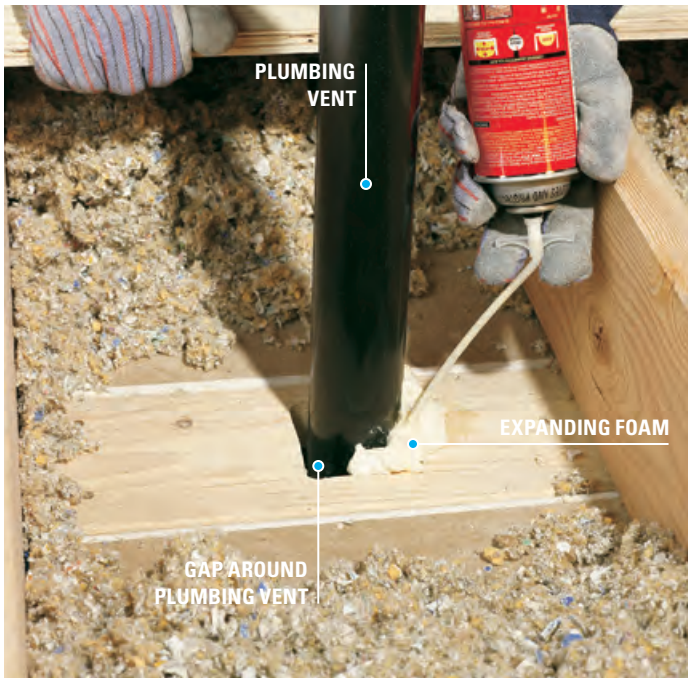
Seal openings around plumbing vents, pipes and electrical wires with expanding foam or silicone caulk (see photos 9 and 10). Be sure to wear gloves and be careful not to get expanding foam on you or your clothes, as the foam is very sticky and is nearly impossible to remove once it sets. When the foam or caulk is dry, cover the area again with insulation.

9. Fill holes with silicone caulk



Fill wiring and plumbing holes with expanding foam. Caulk around electrical junction boxes and fill holes in box with silicone caulk.

10. Stuff gaps with insulation



If the space around the plumbing pipe is wider than 3 inches, you may need to stuff some JM fiber glass insulation into the space to serve as a backer for the expanding foam. Once the insulation is in place, follow the directions on the can to foam the space around the pipe.

Seal and insulate the attic access door

Treat an attic access hatch or pull-down door similarly to a door to the outside—weatherstrip and add JM unfaced insulation. Make sure the R-value is the same as for the rest of the attic. The insulation around the attic access opening may be deeper than the adjacent framing. You may need to build a dam around the opening to keep the insulation in place.

1. If the hatch rests directly on the molding, add 2½-inch-wide stops around the opening. The stops provide a wider surface for attaching the weatherstrip and a space to mount hook-and-eye fasteners.
2. Position the screw eyes so the weatherstrip is slightly compressed with the hooks latched.
3. Cut a piece of JM fiber glass or rigid foam board insulation the same size as the attic hatch and nail or glue it to the back of the hatch.

If there are pull-down attic stairs or an attic door, seal these similarly: Weatherstrip the edges and put a piece of rigid foam board insulation on the back of the door.

11. Weatherstrip the door

Weatherstrip the attic access hatch or door. Cut 1x3 boards to fit the perimeter of the opening and nail them on with 6d finish nails. Apply self-adhesive foam weatherstrip tape to the top edge of the stop.

12. Build insulation dam

Build up the framing around the attic hatch to make an insulation dam. Add braces on all sides to secure the dam to the framing. Put the braces on the opposite side of the hatch so it still can be opened.

13. Attach fasteners

Attach hook-and-eye fasteners to the door and stops. Position the eyes so that the weatherstrip is compressed when you latch the hooks.

If heating and cooling ducts are in the attic, seal and insulate them, too

Leaky and poorly insulated ducts, especially in attics, make it tough for furnaces and air conditioners to keep homes comfortable. Sealing and insulating ducts can increase the efficiency of the heating and cooling system by 20% and greatly increase air flow.

- Check the duct connections for leaks by asking the homeowner to run the heating and cooling system fan. Feel for leaks. Then seal the joints with mastic, which we recommend, or foil tape. Do not use household duct tape.
- Pay special attention to where the ducts come through the floor of the attic and seal these with foam.
- Ducts should also be insulated. If the ducts are uninsulated or poorly insulated (i.e. you see gaps or torn insulation), seal them first, then add Johns Manville Formaldehyde-free™ Microlite® XG™ duct wrap insulation rated at least R-6 to keep the air in the ducts at the desired temperature. (Some codes require R-8, check with your local building codes).

Caution: Tell the homeowner to check for carbon monoxide (CO) to keep the house safe. After making energy improvements that result in a tighter house, CO could build up if gas-burning appliances are not venting properly. If the homeowner has a gas or oil-fired furnace, water heater or dryer, tell them to have their heating and cooling technician check for proper venting.

Materials checklist for attic duct sealing

- ☐ Mastic or foil tape
- ☐ Zip ties to hold duct insulation in place
- ☐ Johns Manville Formaldehyde-free™ Microlite® XG™ duct wrap insulation rated at least R-6
- ☐ ***Reminder***: Follow NAIMA-OSHA Health and Safety Partnership PPE requirements as listed. Wear long pants, a long-sleeved shirt, hat, eye protection, respirator (OSHA N-95 dust mask) and gloves.

Recessed can lights: Big source of air leaks, but no easy solution

Recessed can lights look great, but when they bump into the attic space, they can make a home less energy efficient. Recessed can lights in a one-story house, or in the ceiling of a second story create open holes into the attic that allow unwanted heat flow between conditioned and unconditioned spaces. In the summer, can lights make the room warmer and in the winter they draw warm air up into the attic. Warm air leakage into cold attics can contribute to moisture problems and ice dams (where snow melts and re-freezes at the roof edge or gutters). Here are some suggestions for improving the recessed can lights in the attic:

- **Properly seal can lights**

  You can seal can lights that are not rated ICAT (Insulation-Contact-Air-Tight), but it's complicated and you can create a hazard if you don't do it properly. Remember that non-ICAT lights need 3 inches of air space around them to vent the heat they create.

- **Tell the homeowner to buy Energy Star with ICAT**

  When replacing or adding lights, tell the homeowner to look for Energy Star-qualified recessed fixtures that reduce energy use by as much as 75%. However, it's important to check that the fixture they choose is as bright as they expect, since bulb wattage and optics vary widely. Also, tell them to make sure fixtures have an ICAT rating to minimize heat loss.

- **Tell the homeowner to switch to more efficient bulbs**

  If they're keeping the existing recessed can lights, they can still reduce the lighting energy they use by as much as 75% by installing Energy Star-qualified compact fluorescent light (CFL) bulbs. This includes CFL bulbs specifically designed for recessed can lights with built-in reflectors, which look like traditional incandescent reflector bulbs. As with new fixtures, it's important to check that the CFL bulb is as bright as they want. Please note that switching to CFL bulbs will not solve the air leakage problem.

Caution: Keep all insulation 3 inches from can lights, except those rated ICAT (Insulation-Contact-Air-Tight) or IC (Insulation-Contact). Use a piece of circular metal flashing or wire mesh around the light as a dam to keep the insulation away from the light (see photo 3, page 21).

ADDING INSULATION

Now that you've sealed air leaks, it's time to check insulation levels in the home and add more if necessary.

Is there enough?

To make sure there's adequate insulation, check the table below and measure the existing insulation. In the attic, it's important that the insulation be evenly distributed with no low spots—sometimes there is enough insulation in the middle of the attic and very little along the eaves.

How much should you add?

Add enough insulation to reach the R-value in the table below. Adding more insulation can give your homeowners additional savings in energy costs.

R-Values for Enhanced Home Energy Savings and Comfort - Existing Homes

JM Recommended Cost-effective Insulation R-Values for Existing Homes

If you live in a climate that is...	and your heating system is...[b]	Insulate to these levels in the...			
		Ceiling	Wood-frame wall	Floor	Basement/ crawl space walls[d]
Warm with cooling and minimal heating requirements (i.e., FL & HI; coastal CA; southeast TX; southern LA, AR, MS, AL & GA).	gas/oil or heat pump	Up to R-38	Up to R-13	Up to R-13	Up to R-19
	electric resistance	Up to R-49	Up to R-25	Up to R-19	Up to R-19
Mixed with moderate heating and cooling requirements (i.e., VA, WV, KY, MO, NE, OK, OR, WA & ID; southern IN, KS, NM & AZ; northern LA, AR, MS, AL & GA; inland CA & western NV).	gas/oil or heat pump	R-38	Up to R-22[c]	Up to R-25	Up to R-19
	electric resistance	R-49	Up to R-26[c]	R-25	Up to R-19
Cold [i.e., PA, NY, New England, northern Midwest, Great Lakes area, mountainous area (i.e., CO, WV, UT, etc.)]	gas/oil	Up to R-49	Up to R-22[c]	R-25	Up to R-19
	heat pump or electric resistance	R-49	Up to R-28[c]	R-25	Up to R-19

a. Adapted from the U.S. Department of Energy 1997 Insulation Fact Sheet.
b. Insulation is also effective at reducing cooling bills. These levels assume your house has electric air-conditioning.
c. R-values may be achieved through a combination of cavity insulation and rigid board insulation and are for insulation only (not whole wall).
d. Do not insulate crawl space walls if crawl space is wet or ventilated with outdoor air.

A note about attic ventilation

It's key to insulate, air seal and ventilate an attic to make a durable and energy-efficient home. Here's why: In winter, proper ventilation helps maintain a cold attic, which reduces the chances of ice damming (snow that melts off a roof because the attic is too warm and then re-freezes at the gutters, causing an ice dam that can damage the roof). Properly insulating and air sealing the attic keeps it cold in winter by blocking the entry of warm, moist air from below. In the summer months, well-vented attics help move super-heated air out of the attic, protecting roof shingles, and attic insulation keeps the heat in the attic and cooler air in your living space. NEVER COVER ATTIC SOFFIT VENTS WITH INSULATION (see Installing Rafter Vents on page 20).

A note about attic fans

Attic fans are intended to cool hot attics by drawing in cooler outside air from attic vents (soffit and gable) and pushing hot air out through the fan. However, if the attic is poorly ventilated and not well sealed, attic fans can draw conditioned air up from below, making the air conditioner work harder and increasing the energy bill. Homeowners don't want to cool their unfinished attic with their air conditioner. To prevent this, follow the air sealing and insulation strategies in this guide and make sure the attic is well ventilated, using passive vents and natural air flow.

Add the right kind of insulation

Measure the depth and estimate the R-value of the existing insulation. Add Johns Manville Climate Pro® insulation to bring the insulation to the recommended R-value, since Climate Pro® insulation is the best choice when adding attic insulation.

To estimate R-value of existing insulation

Check product for R-value label. If not present, measure the thickness of the insulation and multiply the thickness in inches by the R-value per inch listed in the table below.

Insulation Type	R-value per inch	Typical Applications
Cellulose, loose fill	3.7	Attic Floor
Cellulose, high density	3.2	Wall, Enclosed Cavities, Framing Transitions
Fiber glass, batts	3.0*	Basement Ceiling, Open Stud Walls, Attic Floor*
Fiber glass, loose fill	2.8	Attic Floor, Walls (existing)
Rockwool	3.0	Attic Floor, Walls, Basement Ceiling (may be loose or batts)
Vermiculite	2.7	Attic Floor
Poly-isocyanurate, rigid board	7.0	Foundation Walls, Attic Access Doors
Polystyrene, expanded rigid board	4.0	Foundation Walls, Sill Plate
Polystyrene, extruded rigid board	5.0	Foundation Walls, Sub-Slab, Sill Plate
Low Density Urethane, sprayed foam	3.7	Attics, Walls (new construction); Sill Plate, Band Joist, Framing Transitions
Urethane, sprayed foam	6.0	Attics, Walls (new construction); Sill Plate, Band Joist, Framing Transition
Urea Formaldehyde Foam	4.0	Attics, Walls (existing)

**Fiber glass batt R-value per inch will range from 2.8 to 4.3, depending on the product. 3.0 is a reasonable estimate for a typical attic batt.*

Installing rafter vents

To completely cover the attic floor with insulation out to the eaves, you need to install rafter vents (also called insulation baffles). Completely covering the attic floor and sealing air leaks will ensure the homeowner gets the best performance from the insulation. Rafter vents keep the soffit vents clear and provide a channel for outside air to move into the attic at the soffits and out through the gable or ridge vent (see Attic Air Flow graphic on page 22).

To install rafter vents:

- Staple them directly to the roof decking. Rafter vents come in 4-foot lengths and 14½- and 22½-inch widths.
- Place rafter vents in the attic ceiling in between the rafters at the point where the ceiling meets your attic floor.
- Once they are in place, you can install sections of JM Formaldehyde-free™ fiber glass insulation batts to the very edge of the attic floor.

1. Place rafter vents

Staple rafter vents to roof sheathing in-between the rafters wherever there is a soffit vent.

2. Add insulation

Add batt insulation around the rafter vent and in adjacent cavities. Install out to the edge of the attic floor to prevent loose-fill insulation from falling into the soffit.

Insulating the attic

- When adding insulation, work from the perimeter toward the attic opening.
- Never install insulation over recessed light fixtures or soffit vents. Keep all insulation at least 3 inches away from can lights, unless they are rated ICAT (Insulation-Contact-Air-Tight) or IC (Insulation-Contact). Use wire mesh or sheet metal to create barriers around the openings.

3. Create a barrier

Use sheet metal or wire mesh to help create a barrier around fixtures or vents. This picture shows the barrier after insulation was installed.

4. Install fiber glass insulation

Use a blowing machine to blow in JM Climate Pro® insulation.

Insulating knee walls

1. If you are using JM faced batts, place the insulation into the cavity so that the facing is next to the drywall. If you are using unfaced batts, place the insulation into the cavity, making sure that it is the correct size and fits snugly at the sides and ends.
2. If the insulation is too long, cut it to fit properly. Don't double it over or compress it. Use a utility knife and straightedge. Cut on a smooth, flat surface, and cut the batts about 1 inch larger than the framing cavity. If the material is too short, cut a piece to size to fill the gap.
3. Fill in any narrow gaps between joists by forcing pieces of unfaced insulation into the gaps with a screwdriver or putty knife.
4. Attach sheathing to the studs to hold the insulation in place.

Attic air flow

The outside air flows through the soffit, along the rafter vent and out through the gable or ridge vent.

- **A** Soffit vent
- **B** Rafter vent
- **C** Ridge vent

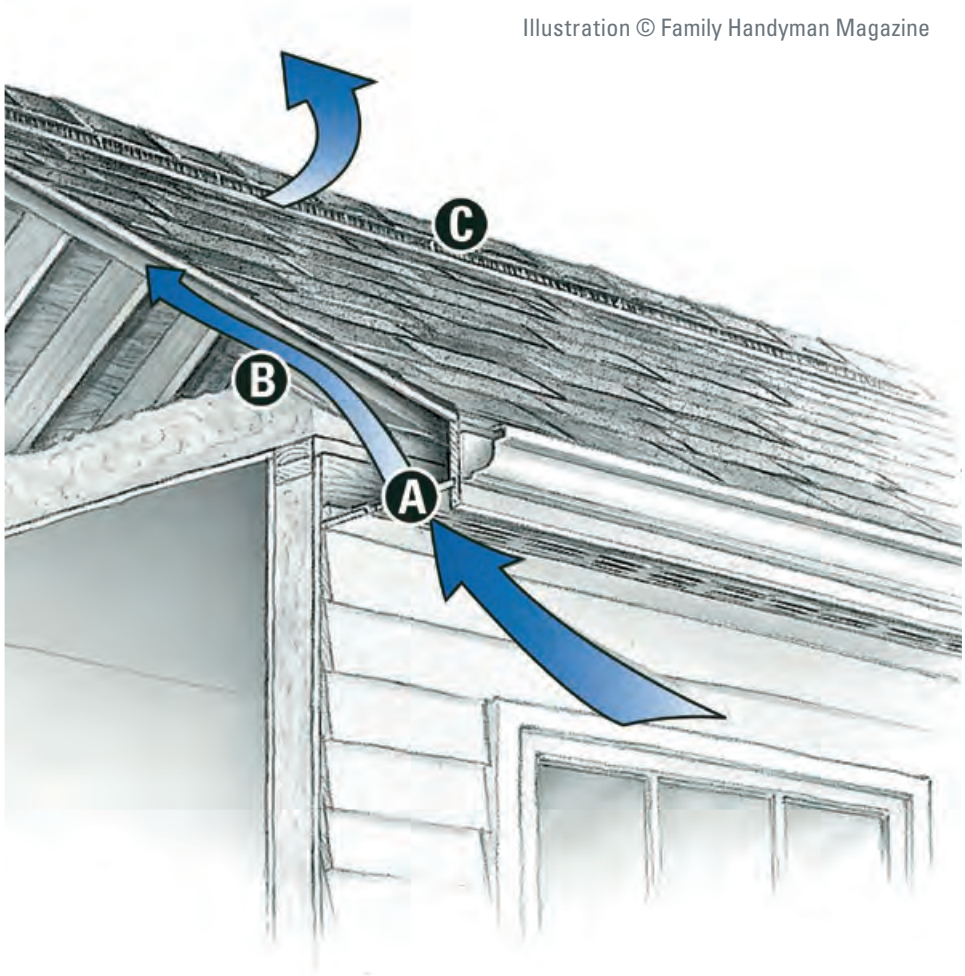


Illustration © Family Handyman Magazine

Finishing basement walls

It's increasingly common for homeowners to finish their basements to add living space. Exterior walls need to be insulated to minimize heat loss through the foundation walls. While there are different options for insulating, the most effective way is to install foam board insulation against the foundation wall, then frame out the wall and install fiber glass batt insulation within the cavity. Keep moisture management in mind when designing the wall and selecting the interior finish.

1. To control moisture, install 1.5-inch thick extruded or expanded polystyrene on the foundation wall before framing out the wall. Seal the joints in the foam with mesh tape and mastic.
2. Frame/furr out the walls with traditional 2x4 studs either 16 or 24 inches on center.
3. Measure and cut a piece of Johns Manville unfaced or Kraft-faced fiber glass insulation to the same size as the stud cavity. Ensure the batt fills the entire cavity top to bottom and side to side. Unfaced is preferred in warmer regions or in any location where the foundation wall may be damp from outside moisture.

An uninsulated, unfinished basement can account for 25% or more of total heat loss from a home.

Insulate basement walls

Install the fiber glass batt insulation by inset stapling, face stapling or friction-fitting the batt within the stud cavity. In this picture, the installer is friction-fitting an unfaced batt.

4. Install the fiber glass batt insulation by inset stapling, face stapling or friction-fitting the batt within the stud cavity. Fiber glass insulation should be installed to maintain a uniform thickness across the entire stud cavity.
5. Split the blanket to envelop any electrical wiring and plumbing; don't compress the insulation.
6. Complete the basement wall by securing the interior finish over the studs.

Insulating the rim joist

Cut an unfaced batt to fit and place against the rim joist. Make sure you don't compress it, and fill all gaps and voids.

Insulate rim joist

Cut batt to fit and fill each cavity space. (Although this picture is of a crawl space, you use the same insulating technique for the rim joist.)

OTHER PLACES TO INSULATE

Crawl spaces or floor

Make sure the ground is covered with 6-mil plastic film and that the sheets overlap each other by at least 12 inches and extend a few inches up the walls.

1. Vented crawl space or floor

If the crawl space is vented (open to the outside), the ceiling should be insulated with the vapor retarder against the subfloor. Hold the insulation in place with lightning rods, 6 inches from each end and 12 - 24 inches in-between.

2. Unvented crawl space

If the crawl space is unvented (part of the basement, not open to the outside), perimeter concrete walls should be insulated with an insulation blanket that extends the height of the wall and 2 feet along the floor. The crawl-space ceiling does not need to be insulated.

Floors

1. Gently press the insulation between the joists. If you're using JM unfaced insulation, allow friction to hold the insulation in place. If you're using JM faced insulation, install it with the vapor retarder positioned toward the subfloor and press into place.
2. Expand the insulation to its full thickness in the joist cavity to ensure complete coverage, but do not compress it.
3. Install lightning rods to hold the insulation in place.

Exterior walls and garages

1. If you are using faced batts, place the batts into the wall cavity and staple the flanges of the batts to the inside or face of the studs about every 12 inches. Kraft facing must be covered with gypsum board or another approved interior finish. Where an exposed application is required, use FSK-25 flame-resistant faced or unfaced insulation. If you are using unfaced batts, place the insulation into the cavity, making sure that it is the correct size and fits snugly at the sides, ends and back.
2. If the insulation is too long, cut it to fit properly. Don't double it over or compress it. If the material is too short, cut a piece to size to fill the gap.
3. Fill in any narrow gaps between joists by forcing pieces of unfaced insulation into the gaps with a screwdriver or putty knife.

Drill-and-fill exterior walls

In older homes, exterior walls may contain little or no insulation. You can blow in JM Spider™ Custom Insulation into exterior-wall closed cavities in one of two ways:

- Remove a few courses of siding and drill holes through the exterior sheathing at each cavity location
- Drill holes through the interior finish board at each cavity location

After install, patch the holes with appropriate materials.

Only installers experienced in drill-and-fill applications should attempt to blow insulation into existing closed cavities. See your JM sales representative for a Spider™ insulation closed cavity coverage chart.

For more information

Contact your JM representative or visit CheckYourFill.com.

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